Sciences, is mainly taken up with the new species discovered by him while acting as Field Agent for the U. S. Department of Agriculture. The author says "the long delay in the publication of the report necessitates the early publication of the new species." The author does not follow the "Rochester Rules" of nomenclature, and gives some reasons for not doing so, but the reader is amused to find under *Oxytropis acutirostris* (Watson) the remark "should it be necessary to reduce this genus to *Spiesia*, the name must be *S. acutirostris* (Watson)," and again under *Oxytropis nothoxys* (Gray), the synonym *Spiesia nothoxys* (Gray). For one who does not accept the "Rochester Rules" this is indeed a remarkable proceeding, since it is the deliberate addition of two synonyms (with "Jones" as the authority) to what the author calls "the mass of new names, nine-tenths of which are wholly useless."—K. C. Davis has issued a "Key to the Woody Plants of Mower County, in Southern Minnesota, in their Winter Condition" in the form of a five-page pamphlet. It will be useful in the region for which it is intended.—An interesting paper comes from Dr. G. Clautriau of Brussels, entitled Étude Chemique du Glycogène chez les Champignous et les Levures," from which we hope to make extracts in some future number.—CHARLES E. BESSEY.

VEGETABLE PHYSIOLOGY.[1]

Ambrosia.—By this name Schmittberger designated a soft watery substance found in the burrows of certain beetles and supposed to be of use in feeding the larvæ. The exact nature of this ambrosia appears to have been for a time in doubt, owing to the fact that it was generally seen by entomologists rather than by mycologists. Of late years, however, it has been conceded to be of fungous origin, although no one appears to have studied it critically. Since the appearance of Möller's book on the Fungous Gardens of South American Ants, the subject of ambrosia has received renewed attention. In this country, Mr. Henry G. Hubbard, who has long paid especial attention to the habits of coleoptera, has repeatedly observed this substance in the chambers of *Xyleborus pubescens* in orange trees in Florida, and has recently discovered it in the burrows of *Corthylus punctatissimus* in

[1] This department is edited by Erwin F. Smith, Department of Agriculture, Washington, D. C.

the roots of whortleberry near Washington, D. C. Specimens from the latter source were submitted to various students of fungi in Washington last autumn for identification, and the writer had full opportunity to examine this substance. Some of the chambers were filled with it, others partly filled, and others free from it. It is a colorless much septate mycelium, inclined to be constricted at the septa, and in places consisting of rounded, nearly iso-diametric, colorless, rather thick-walled cells, not sufficiently differentiated from the mycelium to be considered as true spores. It appears to be the mycelial or oidial stage of some higher fungus, probably of some Ascomycete. From its distribution in the burrows and the behavior of the beetles toward it, there can be little doubt that it serves them for food. Whether like the ants they actually cultivate it, is another question and one more difficult to solve. In Germany, where this ambrosia was first discovered, Prof. R. Goethe, Director of the Royal Lehranstalt fur Obst-Wein-und Gartenbau zu Geisenheim am Rhein, has recently published an account of its discovery in the chambers of *Xyleborus dispar*. Prof. Goethe's brief note (p. 25, *Berichte d. Kgl. Lehranstalt* etc.) is accompanied by a good figure, judging from which the fungus appears to be the same as that found in the chambers of *Corthyllus punctatissimus* near Washington. This fungus is said to be the same as that found in 1883 in the burrows of *Xyleborus* in cherry trees at Kamp am Rhein. Concerning the use made of this fungus by the beetles he makes the following statement: Seine Wucherungen dienen ganz unzweiflehaft den Käfern zur Nahrung, denn man sieht deutlich, wie der Ueberzug stückweise abgeweidet wird. Further study of this subject would undoubtedly bring to light many interesting things. In the next number of the NATURALIST I hope to publish a note from Mr. Hubbard on this subject.—ERWIN F. SMITH.

White Ants as Cultivators of Fungi.—In connection with the preceding it may be worth while to reprint part of a note which appeared in *Grevillea*, June, 1874, p. 165–6, relative to the occurrence of fungi in the nests of termites in India. A writer in the *Gardeners' Chronicle* stated that he had never seen any fungi on or in nests of white ants except very small ones less than the size of a pin head. In opposition to this Mr. W. F. Gibbon, Doolha, Goruckpore, wrote to the Horticultural Society of India as follows: "I send you now a bottle containing mushrooms I extracted a few days ago from the center of a white ant hillock. When I collected them they were in appearance like asparagus, over 14 inches in length, and the people about here

consider them particularly good eating, partaking of them both raw and cooked. When I read the above article in your Society's Journal somewhat over a year ago, I was then aware that mushrooms existed in the interior of ant hills, for I had often seen them, but I did not know their season of sprouting, and whenever I searched was unsuccessful till the other day. I have now ascertained the season they sprout is the end of August or the beginning of September, and I believe all ant hills produce them. These mushrooms appear to me to proceed from a peculiar substance always found in ant hills in this country (whether white or black), generally called ants' food, a bluish gritty substance, like coarse wheat flour turned mouldy and adhesive. In dry weather brittle, and in damp weather like soft leather. It is this substance, under the combined influence of heat, damp and darkness from which the mushrooms grow. As my experience is at variance with the writer in the *Gardeners' Chronicle*, you may care to record it. * * * I would like these mushrooms, if possible, referred to some mycologist, and their names ascertained; and I would like also to know if the bluish substance, the ants' food, was collected and treated artificially, could similar mushrooms be raised." These mushrooms were submitted to Dr. D. D. Cunningham, who reported as follows: "I herewith return the letter sent to me more than a month ago, along with specimens of fungi said to have been procured from the interior of a white ant hill. The specimens apparently belong to some species of *Lepiota*, and are chiefly remarkable for the extreme length and coarse fibrous contents of the stem. The occurrence of fungi in connection with ant hills is well known, but in so far as I am aware, those hitherto described as occurring on the hills of the white ant belong to species of the Gasteromycetous order *Podaxinei*, so that the occurrence of a species of one of the sub-genera of Agaricus in such localities is a new and interesting fact. With regard to the material from which they arise, and which must apparently be of the same nature as the so-called spawn of the cultivated mushroom, consisting of vegetable debris permeated by the mycelium of the fungus, it may be noted that a similar substance is described by Belt as occurring in the nests of the leaf-cutting ants in Nicaragua, and is supposed by him to serve as food—the ants culling and storing the leaves for the sake of the fungi which are subsequently developed in the debris (*Naturalist in Nicaragua*, p. 80). Were this spawn artifically exposed to conditions similar to those which it naturally encounters in the interior of the hillocks—heat, darkness and moisture—I believe that the pilei

might very probably be raised at will, and if they really are good eating, the experiment would be well worth trying."

—ERWIN F. SMITH.

Desert Vegetation.—Perhaps the most interesting part of Rev. George Henslow's recent book, *The Origin of Plant Structures*, are the two chapters on desert plants. The first of these chapters is devoted to a consideration of the origin of the morphological peculiarities of desert plants; the second to the histological peculiarities of such plants. A large amount of data are brought together, rather hastily it would appear, going to show that the peculiarities of desert plants are the direct outcome of the conditions under which they grow, in other words, that these peculiar modifications, such as reduction of leaf surface, increase of succulency, acquisition of spines, development of water storage tissues, sinking of the stomata below the level of the surface, excessive development of cuticle, of wax, or of hairiness, change from annual to biennial or perennial, increased length of roots, etc., are all brought about by the direct action of environment on the plant. "Natural selection," in the author's own words, "plays no part in the origin of species." These two chapters are well worth the perusal of all who are interested in the study of the flora of our western mountains and arid plains, and the whole book will serve to provoke thought. Other chapters deal with origin of structural peculiarities of alpine and arctic plants; maritime and saline plants; phanerogamous aquatic plants, etc. The book is a companion volume to the author's *Origin of Floral Structures through Insects and other Agencies.*—ERWIN F. SMITH.

A Second Rafinesque.—*Die Pestkrankheiten (Infectionskrankheiten) der Kulturgewächse; Nach streng bakteriologischer Methode untersucht und in völliger Uebereinstimmung mit Robert Kochs Entdeckungen geschildert von Prof. Dr. Ernst Hallier*, is one of the querest books it was ever the lot of the writer to read. It was published at Stuttgart in 1895 by Erwin Nägale, and contains 144 8 vo. pages and 7 fairly well executed plates. Concerning this book it may be said that its author is either an undiscovered great genius or else a very crazy man. About one-third of the book is given up to caustic abuse of Anton de Bary and his students, relative to which it may be said that Dr. de Bary's reputation is safe not only in the hands of his friends but also in the hands of all who love clear thinking and honest work; and all this without defending any of the errors into which he may have fallen. Another third of the book or thereabouts is devoted to the description of old and well known species of Peronosporaceæ,

little that is really new being added, but most facts being correctly stated. The names of many of the species, however, are changed for reasons which would not be recognized as good even by the most ultra radical. For example *Cystopus candidus* is changed to *C. capsellæ* E. H. because the fungus is said to grow mostly on Capsella and every fungus should be named as far as possible from the host it infests. In like manner *Cystopus cubicus* becomes *C. compositarum* E. H.; *Phytophthora infestans, P. solani* E. H.; *Peronospora sparsa, P. rosæ* E. H., etc. In the same way the author puts his initials after many old genera e. g., Phytophthora and Peronospora, or substitutes other names, e. g. *Zoospora* E. H. for *Plasmopara,* because he concieves the name to have been originally employed in a different sense from that in which it is now used or in which he employs it. The other idea running through the book and occupying at least a third of it is that bacteria originate from plastids developed inside of the cells of fungi, and that we shall never make any progress in the study of animal and plant diseases due to bacteria until we determine from just what fungi they originate. The potato rot, for example, is due to bacteria developed from the broken down mycelium of the fungus *Phytophthora infestans.*

"If now one keeps for a long time in observation under the microscope such an escaped mass of plasma [from the mycelium or conidia of Phytophthora] one beholds, just as in the cases already mentioned by us, the freeing of the plastids, their change into micrococcus, and the elongation, division, etc. of these." (P. 82). In *Peronospora ficariæ* also "the origin of the microörganisms is unquestionable, but until now I have not been able to follow them further. These organisms are visible in a fresh section in the interior of the leaf tissue of the host." (P. 134.) The converse of this proposition is also true i. e. that under certain conditions bacteria change back again into the original fungus, the growth of certain yeast cells into mycelium being cited as a case in in point. "If these [bacteria] arise from definite fungi by the finally free development of the plastids, it must also come to pass that the micrococcus, which is the first product of the freed plastids, will again give rise to the higher fungous form from which it originated. Of this the first well known and precise example is the history of the development of the beer yeast." (P. 105.). The author who is a graduate of one of the German Universities, formerly held a chair of botany in one of them, and has been writing books similar to this one for the last 30 years claims to have seen the change from fungous plastids inside of mycelia or spores into genuine free swimming bacteria, rods and cocci. This change is difficult to bring about artifically, requiring long watch-

ing at the microscope and the partial exclusion of air from the preparation. Figures are given of these plastids and of the bacteria. All of which reminds us of the proof of miraculous healing by holy water at certain wells, viz., " the well is with us to this day." The author complains that nobody reads his books, but this cannot be charged against the writer who has patiently waded through the whole of this one, to very little profit, however, it must be confessed. The absurdities, however, are not so numerous as in the author's *Phytopathology*, published in 1868. Therein may be found, full fledged or in embryo, most of the queer notions here set forth and also many others.

ERWIN F. SMITH.

ZOOLOGY.

The Cruise of the Princess Alice.—The zoological material obtained by the Prince of Monaco during the past summer cruise of his yacht, the Princess Alice, is abundant and valuable. The fortunate capture of a sperm whale in the vicinity of the yacht, off the coast of Terceira Island, resulted in the acquisition of some rare specimens of the animal kingdom which otherwise might never have been known. From the Prince's narrative of the voyage we learn that the cachalot was the " catch " of some Portugese whalers with whom the Prince arranged to secure what portions of the animal he wished, especially the brain. Unfortunately some days elapsed before the skull was penetrated, and then the brain was found to be in too advanced a stage of decomposition to be of use for preservation. Meantime a large number a parasites were collected from the stomach, the digestive organs, the blubber and the skin of the animal, and the contents of the stomach secured for examination. While in the act of death the whale ejected several large cephalopods which it had only just swallowed, as was evident from their perfect preservation. These were also obtained by the Prince for his collection. Amongst them were three large specimens, each over one meter in length, of a species probably new, of the little-known genus Histioteuthis; also the bodies of two other immense cephalopods so different from all hitherto known that it is impossible to place them in any genus or even family of this order. M. Jonbain proposes for them the name *Lepidoteuthis grimaldii*. One of these specimens is a female, of which the body, or visceral sac after prolonged immersion in formol and alcohol, still measures 90 cm. in length, from which it is